

HVAC Filtration Bypass Air

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“Bypass Air” is a term often used in HVAC technology to describe air that “bypasses” the air filter and continues downstream. The phenomenon is often published and/or discussed; however, the effects of bypass air are rarely quantified. Allowing air to bypass final filters can result in indoor air quality problems and unnecessary costs for building owners and facility managers.

To **quantify** the effects of bypass air in a typical HVAC system, an ASHRAE test was set up with an independent testing company to study and document the effects of bypass air around an air filter in a test duct. In the experiment, a 24” x 24” 95% ASHRAE air filter was installed in a test duct and tested for efficiency following the ASHRAE Standard 52.2. After measuring the efficiency of the properly sealed air filter, a 5/32-inch space was created on one side of the air filter allowing “bypass”. The test was reconstructed with all conditions remaining identical with the exception of the single bypass air variable.

The two corresponding efficiency curves represent the filters’ testing when properly sealed and the previously described bypass air. This graph shows that an improperly sealed filter at 95% efficiency (MERV 14) has a net efficiency comparable to a 20-25% efficient (MERV 8) filter.

Conclusion:

From the data, it can be **concluded** that space left beside an air filter, due to improper sealing, will allow bypass air to significantly reduce the specified efficiency of the filter. This unfiltered air will contaminate downstream fans, coils, ducts and registers; leading to future indoor air quality problems. This can also lead to higher energy costs due to equipment efficiency losses.

Efficiency Curves

